

# Summary of Agate Fossil Beds NM, Scotts Bluff NM, and Fort Laramie NHS GRI meeting *March 3-4, 2003*

## SUMMARY

A Geologic Resources Inventory (GRI) workshop was held for Agate Fossil Beds NM (AGFO), Scotts Bluff NM (SCBL), and Fort Laramie NHS (FOLA) on March 3-4, 2003. The purpose was to view and discuss the park's geologic resources, to address the status of geologic mapping for compiling both paper and digital maps, and to assess resource management issues and needs. Cooperators from the NPS Geologic Resources Division (GRD), AGFO, SCBL, FOLA, Fossil Butte NM (FOBU), and the University of Nebraska were present for the workshop.

This involved field trips to various points of interest in AGFO and SCBL, as well as a half-day scoping session to present overviews of the NPS Inventory and Monitoring (I&M) program, the GRD, and the on-going GRI. Round table discussions involving geologic issues for AGFO, SCBL and FOLA included the status of geologic mapping efforts, interpretation, sources of available data, and action items generated from this meeting. Because of time and logistical limitations, FOLA did not get a site visit during the scoping session.

For a list of meeting attendees, see **Appendix A (List of attendees for Agate Fossil Beds NM, Scotts Bluff NM, and Fort Laramie NHS GRI Workshop, March 3-4, 2003).**

## OVERVIEW OF GEOLOGIC RESOURCES INVENTORY (GRI)

The NPS GRI has the following goals for some 273 units with significant natural resources:

- 1) To assemble a bibliography ("**GRBIB**") of known geological publications to compile and evaluate a list of existing geologic maps for each unit,
- 2) To conduct a scoping session for each park,
- 3) To develop digital geologic map products for use in a GIS (geographic information system), and
- 4) To complete a geologic report that synthesizes much of the existing geologic knowledge about each park.

It is stressed that the emphasis of the inventory is not to routinely initiate new geologic mapping projects, but to aggregate existing "baseline" information and identify where serious geologic data needs and issues exist in the National Park System. In cases where map coverage is nearly complete (ex. 4 of 5 quadrangles for Park "X") or maps simply do not exist, then funding may be available for geologic mapping.

After introductions by the participants, Tim Connors (NPS-GRD) presented overviews of the Geologic Resources Division, the NPS I&M Program, the status of the Natural Resource Inventories, and the Geologic Resource Inventory in particular.

He also presented a demonstration of some of the main features of the digital geologic database for Saguaro NP in Arizona. This has become the prototype for the NPS digital geologic map model as it reproduces all aspects of a paper map (i.e. it incorporates the map notes, cross sections, legend etc.) with the added benefit of being geospatially referenced. It is displayed in ESRI ArcView shape files and features a built-in Microsoft Windows help file system to identify the map units. It can also display scanned JPG or GIF images of the geologic cross sections supplied with the paper "analog" map. Geologic cross section lines (ex. A-A') are subsequently digitized as a line coverage and are hyperlinks to the scanned images.

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## **GRBIB**

Usually at the scoping session, individual Microsoft Word Documents of Geologic Bibliographies for the scoped parks (AGFO, SCBL, and FOLA) get distributed. However, at this meeting, they were not, so they will be sent to meeting participants at a later time.

The sources for this compiled information are as follows:

- AGI (American Geological Institute) GeoRef
- USGS GeoIndex
- ProCite information taken from specific NPS park libraries

These bibliographic compilations were validated by GRI staff to eliminate duplicate citations and typographical errors, as well as to check for applicability to the specific park. After validation, they become part of a Microsoft Access database parsed into columns based on park, author, year of publication, title, publisher, publication number, and a miscellaneous column for notes.

For the Access database, they are exported as Microsoft Word Documents for easier readability, and eventually turned into PDF documents. They are then posted to the GRI website at:

<http://www2.nature.nps.gov/grd/geology/gri/products/geobib/> for general viewing.

Ruthann Knudson has supplied an additional list of other known natural resource-related publications for AGFO to GRI staff, and this still needs to be incorporated into GRBIB.

## **EXISTING GEOLOGIC MAPS AND DIGITAL DATA**

After the bibliographies were assembled, a separate search was made for any existing surficial and bedrock geologic maps for AGFO, SCBL, and FOLA. The USGS and other entities have published numerous quadrangles in the area at various scales and of variable vintage. Also of note is that digital data sets for the vegetation of AGFO, SCBL and FOLA have been produced, and can be downloaded from the USGS at <http://biology.usgs.gov/npsveg/products/parkname.html>

As for soils, according to NPS Soil Scientist Pete Biggam, mapping and digitizing is complete for SCBL and AGFO, and is in internal review with NPS. Therefore, they are not currently available for download. Of note, both are part of county datasets that need to be clipped down to park boundaries and Pete still needs the textual document that accompanies the maps. FOLA data is inapplicable (old and out of date), and is inactive currently as of today according to Pete.

## ***Agate Fossil Beds NM***

Bob Hunt (University of Nebraska) furnished GRI staff with the "Geologic Map of the Agate Fossil Beds National Monument" (created in 1977). It is a very large-scale map of the entire monument (with the exception of the Agate Springs Ranch area. However, Bob noted that he does have aerial photo coverage of that area and could easily incorporate it into this existing map. This map has never been digitized, so GRI staff will digitize and attribute as per the GRI model and will report back when it is complete.

Bob noted some changes in terminology from the 1977 map as well. The Miocene "Upper Harrison Beds" are now defined as the "Anderson Ranch Formation" and his "unnamed lithic unit" is now recognized as the Oligocene Sharp's Formation.

Bob also mentioned that he is currently mapping the 7.5' quadrangles of interest to AGFO (Agate and Whistle Creek) as part of the Nebraska StateMap project, so there will be a significant buffer around

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the park as well when he is complete. His interest in mapping this area stems from it having one of the best mammalian records of evolution in the world. GRI staff offered to digitize these maps as well when they are complete.

As mentioned, additional digital data sets exist for soils and vegetation for AGFO. Ruthann Knudson (AGFO superintendent) is interested in deriving a more useful surficial geologic map of the area based on the combination of soils, vegetation and bedrock geology.

### ***Scotts Bluff NM***

Currently, there are 9 quadrangles of interest for SCBL (Lake Alice, Scottsbluff North, Mitchell, Minatare, Scottsbluff South, Roubadeau Pass, Wright Gap, Wildcat Mountain, Murray Lake NE). Of these, none are known to have large-scale (1:24,000) mapping of the individual quadrangles. Bob Hunt suggested contacting the Nebraska Conservation and Survey Division to see if these might be incorporated into the StateMap project if they are not already mapped at suitable scale.

However, there are smaller scale maps for the area, but it is not known if any of these are digitized. A list follows.

- Nebraska Conservation and Survey Division, 1992, Scotts Bluff County deep well map, University of Nebraska Conservation and Survey Division, Deep Well Map 12, 1:62500 scale
- Vondra, C.F.; Schultz, C.B.; Stout, T.M., 1969, New members of the Gering Formation (Miocene) in western Nebraska including a geological map of Wildcat Ridge and related outliers, Nebraska Geological Survey, 18, 1:63360 scale
- Darton, N.H., 1903, Camp Clarke folio, Nebraska, US Geological Survey, GF-87, 1:125000 scale
- Wenzel, L.K., Cady, R.C., and Waite, H.A., 1946, Geology and ground-water resources of Scotts Bluff County, Nebraska, US Geological Survey, Water-Supply Paper 943, 1:125000 scale
- Drew, L. J.; Schuenemeyer, J. H.; Bawiec, W. J., 1979, Petroleum exhaustion maps of the Cretaceous "D-J" sandstone stratigraphic interval of the Denver Basin; exhaustion sequence maps of detailed study area plotted by assuming 2-MI(2) targets, US Geological Survey, Map I-1138, 1:200,000 scale
- Vondra, C.F., Schultz, C.B., and Stout, T.M., 1969, Location of the Gering Channel facies in relation to Gering outcrops in Wildcat Ridge western Nebraska, University of Nebraska Conservation and Survey Division, Nebraska Geological Survey, Paper 18, 1:156
- DeGraw, H.M., 1968, Configuration of the Pre-Tertiary surface in western Nebraska, University of Nebraska Conservation and Survey Division, of 79-943, 1:250000 scale
- Dugan, J.T., 1984, Hydrologic characteristics of Nebraska soils, U.S. Geological Survey, Water-Supply Paper 2222, 1:250000 scale

### ***Fort Laramie NHS***

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There are already a few USGS large-scale geologic maps covering the area. These include the following:

- McGrew, Laura, 1963, Geology of the Fort Laramie area, Platte and Goshen Counties, Wyoming, US Geological Survey, Bulletin 1141-F, 1:31680 scale
- Sims, P.K., Day, W.C., and Klein, Jerry, 1999, Geologic map of Precambrian rocks of the Hartville uplift, southeastern Wyoming, with a section on mineral deposits in the Hartville uplift, US Geological Survey, I-2661, 1:48000 scale
- Sims, P.K., Day, W.C., Snyder, G.L., Wilson, A.B., and Peterman, Z.E., 1997, Geologic map of Precambrian rocks along part of the Hartville uplift, Guernsey and Casebier Hill quadrangles, Platte and Goshen Counties, Wyoming with a section on geochronology

It is not known if any of these maps have been converted to digital GIS files, so Tim Connors will be following up with the Wyoming Geological Survey and the USGS for any knowledge of these maps.

### **SPECIFICALLY MENTIONED PARK MANAGEMENT NEEDS RELATED TO GEOLOGY**

#### ***FOLA***

Tammy Benson mentioned that increased erosion is occurring in the springtime along the Laramie and Platte Rivers, and is subsequently uncovering “cultural” resources (buffalo and elk bones attributed to hunting). The park is located on a terrace, but no bedrock is exposed in the park, so it is likely that surficial geologic-, soils- and vegetation maps will be more useful than bedrock maps of the park. The park has some man-made wetlands and “hardpan”. Mineral rights exist in the area and are held by non-federal entities; the exact commodities are unknown at this point. Additionally, Tammy mentioned the park has sand and gravel sites in the park that might need reclamation. These are located near the county cemetery and below the hospital.

#### ***SCBL***

Valerie Naylor and Robert Manassek weren't sure why the park had 9 quadrangles of interest, but figured it was likely because of the view shed around the park. Therefore, they thought it most important to have digital datasets for the Scottsbluff South quadrangle at a large-scale, because of the potential for expansion to the west.

They also mentioned that the single most important issue pertaining to geology at the park involves rockslides on park roads and trails that represent potential dangers to park visitors and degradation of the natural resources (the cliffs) via erosion and mass wasting. The road to the top of the park is bounded by very steep cliffs that have numerous rock falls, as well as the walking trails that lead to the top. Phil Cloues (NPS-GRD) and Federal Highways have evaluated this problem in the park before. In 2000, approximately 3000 tons of rock fell on the park road. Also, the Saddle Rock Trail had similar problems in October 2000. An environmental assessment (“Environmental Assessment Saddle Rock Landslide Hazard Removal Scotts Bluff NM, March 2001”) was done, and subsequently large amounts of unstable material were blasted away to keep the trail open.

Near the man-made tunnels of the main park road, Federal Highways has used the latest geotechnical engineering methods to attempt to stop rock fall around the tunnels by applying shockcrete to blend in with the natural surroundings

It was suggested by Vince Santucci to have Hal Pranger (GRD) conduct a landslide assessment, much like the one he did for Fossil Butte NM.

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Because SCBL has Oligocene fossils in the Brule Formation (the same unit that makes up most of the Badlands NP area in South Dakota), it might make for an interesting research project to compare/contrast the geological resources of each park, and perhaps recognize more paleontological resources. A paleontological survey would be useful for the park.

The park has three irrigation canals that pass through the park. There are also FEMA designated floodplains, floodways, and wetlands. Additionally there is a natural spring (cistern) emanating within the park.

During World War II there was a clay pit that was excavated near the bluff along the eastern boundary. The commodity was simple clay.

The park has a geologic brochure entitled "The Rocks of Scotts Bluff", and it has a detailed stratigraphic column and the abridged version of the parks geologic story. There are also some GSA

### **AGFO**

Ruthann Knudson plans to have a paleontological inventory done this summer

Along University and Carnegie Hills, there are a few locations of geologic instability and rock falls that have been previously addressed. The park has put signs up to warn visitors of potential rock fall areas.

The park does have some regional minor oil and gas issues.

### **GEOLOGIC REPORTS**

Ruthann says there is no encompassing geologic report for all three parks, so it would need to be written. However, on an individual basis, each park might have suitable reports. A few references are cited below:

- Pabian, Roger K., and Swinehart, James B. II, Geologic History of Scotts Bluff National Monument. Lincoln: University of Nebraska, 1979.
- Swinehart, James B. II, et al. Cenozoic Paleogeography of Western Nebraska, Rocky Mountain Section- SEPM, Lincoln: University of Nebraska, 1985.
- Swinehart, James B. II, Loope, David B., Late Cenozoic geology along the summit to museum hiking trail, Scotts Bluff National Monument, western Nebraska, North Central Section: Geological Society of America Centennial Field Guide, 1987.
- Trimble, Donald E., The Geologic Story of the Great Plains, Medora, North Dakota: Theodore Roosevelt Nature and History Association, 1990.

**Appendix A**  
**List of attendees for AGFO, SCBL and FOLA GRI Scoping Meeting**  
**March 3-4, 2003**

NAME	TYPE	AFFILIATION	TITLE	PHONE	E-MAIL	Scoping Session	Field Trip		
							AGFO	SCBL	FOLA
Tammy Benson	federal	NPS-FOLA	chief ranger	307-837-2221	Tammy_Benson@nps.gov	yes	no	No	No
Tim Connors	federal	NPS, Geologic Resources Division	geologist	(303) 969-2093	Tim_Connors@nps.gov	yes	yes	Yes	No
Mark Hertig	federal	NPS-AGFO	curator	308-668-2211	Mark_Hertig@nps.gov	yes	yes	No	No
Bob Hunt	academic	University of Nebraska (Lincoln)	geologist	402-472-2650	rhunt2@unl.edu	yes	no	No	No
Ruthann Knudson	federal	NPS-AGFO	superintendent	308-668-2211	Ruthann_Knudson@nps.gov	yes	yes	No	No
Robert Manasek	federal	NPS-SCBL	natural resources	308-436-4340	Robert_Manasek@nps.gov	yes	no	yes	No
Lil Morava	federal	NPS-AGFO	visitor use assistant	308-668-2211	Lil_Morava@nps.gov	yes	no	No	No
Valeri Naylor	federal	NPS-SCBL	superintendent	308-436-4340	Valerie_Naylor@nps.gov	yes	no	No	No
Vince Santucci	federal	NPS, Fossil Butte NM, Wyoming	paleontologist	(307) 877-4455	Vincent_Santucci@nps.gov	yes	yes	yes	No

## Appendix B

### Quadrangles of Interest for AGFO, SCBL, and FOLA

